Description of an Apparatus for the Analysis of the Compound Inflammable Gases by slow Combustion; with Experiments on the Gas from Coal, explaining its Application. By William Henry, *M.D. Vice-Pres. of the Lit. and Phil. Society, and Physician to the Infirmary, at Manchester. Communicated by* Humphry Davy, *Esq. Sec. R.S.* Read June 23, 1808. [*Phil. Trans.* 1808, *p.* 282.]

The object of this memoir is to remove some obstacles which present themselves to a successful inquiry into the nature of compound inflammable gases. When a vegetable substance is submitted to distillation, at a temperature not below that of ignition, the equilibrium of affinities is destroyed, and the elements composing it are united in a new manner. The carbon, uniting with oxygen, either composes carbonic acid gas, or stopping short of that degree of oxygenation, is converted into carbonic oxide. The hydrogen, combining with a portion of charcoal, forms either carburetted hydrogen gas, or super-carburetted hydrogen, better known by the name of olefiant gas. Towards the close of the process, simple hydrogen gas is also mingled with the products.

The method hitherto pursued for the analysis of inflammable gases, has consisted in mixing them with a known proportion of oxygen, burning the mixture by the electric spark, noting the first contraction and subsequent diminution, by lime-water, for the quantities of water and of carbonic acid formed, and thence inferring the proportion of hydrogen and of carbon in the gas examined, without making due allowance for the possible admixture of carbonic oxide, either before or after the combustion.

The author ascertains the presence of this gas by its great specific gravity, and by the very small proportion of oxygen with which it unites; but in the distillation of coal there is also often present a quantity of sulphuretted hydrogen, and an inflammable gas, which may possibly be a gas *sui generis*, but is more probably a mixture of carburetted hydrogen and carbonic oxide.

In Dr. Henry's apparatus, which is not readily explained without reference to a drawing, the gas to be examined is passed through a small tube into a receiver containing oxygen gas, and is there burned by a continued flame. The quantity of gas introduced, and quantity of contraction, are noted. The quantity of carbonic acid formed is found by liquid potash. The remaining oxygen is determined by sulphuret of lime. As it sometimes happens that part of the gas escapes combustion, precautions are given for avoiding that source of error, and the means of detecting it described.

Instances are given of computation, from combustion, of hydrogen gas, of olefiant gas, as the most simple, and of gas from cannel coal, in which it is a problem of some difficulty to determine the proportions of all the gases that occur; and these are carbonic acid, sulphuretted hydrogen, olefiant gas, carburetted hydrogen, and carbonic oxide.

The sum of the two first is determined by liquid potash, after

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which the third is ascertained by oxymuriatic gas. The sum of the second and third may be determined by oxymuriatic gas, and then the first absorbed by liquid potash. The first and third being thus known, the second may be inferred, though not removed alone.

The nature of the inflammable residuum is then learned by combustion, due regard being had to its specific gravity, and to the proportion which the carbonic acid formed bears to the oxygen consumed.

A table is given of the products of various gases, from several different species of coal; and a second table, of the specific gravities of these gases, with the quantities of carbonic acid formed from each, and the quantity of oxygen required for their combustion. It is observed generally, that in the distillation of all these substances, the gas received at the commencement of the process is the heaviest, that it requires the largest proportion of oxygen, and is fittest for the purpose of illumination.

An Account of some Peculiarities in the anatomical Structure of the Wombat, with Observations on the female Organs of Generation. By Everard Home, *Esq. F.R.S.* Read June 23, 1808. [*Phil. Trans.* 1808, *p.* 304.]

The author, having received a male wombat alive from one of the islands in Bass's Straits, had an opportunity of observing its habits in a domesticated state, and of examining the peculiarities of its internal formation after death, particularly the mechanism of the bones and muscles of its hind legs, which have not been described either by Geoffroy, in his account of its internal form, or by Cuvier, who has described several parts of its internal structure in his *Leçons d'Anatomie Comparée*. The stomach of the wombat resembles closely that of the beaver, and differs so much from that of the kanguroo, and other animals of the opossum tribe, that it forms an extraordinary peculiarity. An account of the dissection of a female wombat having been received from the late Mr. Bell, Surgeon to the Colony at New South Wales, Mr. Home has inserted Mr. Bell's description, with remarks especially on the state of the uterus, which was double, and impregnated on each side; that on the right side was as large as a pullet's egg. The os tincæ was filled with a thick gelatinous substance. When a longitudinal incision was made into its cavity, its coats were found lined with the same jelly, in the centre of which was an embryo wrapped up in very fine membranes, that appeared to have no connexion by vessels with either the uterus or the gelatinous matter.

These facts, says Mr. Home, throw considerable light on the mode of propagation of this very curious tribe of animals. They confirm, in the most satisfactory manner, the observations contained in a former paper on the kanguroo, which required further evidence, as the specimen on which the observations were made had been sent to England preserved in spirits, and the parts had become very indistinct, from being coagulated and long kept.